



# UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE  
United States Patent and Trademark Office  
Address: COMMISSIONER FOR PATENTS  
P.O. Box 1450  
Alexandria, Virginia 22313-1450  
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/842,000	04/26/2001	Toru Otsubo	503.39737X00	7052
20457	7590	11/23/2004	EXAMINER	
ANTONELLI, TERRY, STOUT & KRAUS, LLP 1300 NORTH SEVENTEENTH STREET SUITE 1800 ARLINGTON, VA 22209-9889			CROWELL, ANNA M	
			ART UNIT	PAPER NUMBER
			1763	

DATE MAILED: 11/23/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

# Office Action Summary

Application No.

09/842,000

Applicant(s)

OTSUBO, TORU

Examiner

Michelle Crowell

Art Unit

1763

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --  
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

## Status

- 1) ☒ Responsive to communication(s) filed on 27 August 2004.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

## Disposition of Claims

- 4) ☒ Claim(s) 1-3, 7 and 8 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-3, 7 and 8 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

## Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

## Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

## Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)  
Paper No(s)/Mail Date \_\_\_\_\_.
- 4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date. \_\_\_\_\_.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: \_\_\_\_\_.

### DETAILED ACTION

1. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

2. Claim 2 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 2 is unclear because it recites the recitation of “a magnetic field formed by **coils**”; however, the specification supports the magnetic field being formed by “**a coil**” (pg. 21, lines 1-4). Thus, the use of multiple coils to generate a magnetic field is unclear.

### *Claim Rejections - 35 USC § 103*

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

4. Claims 1-2, 7, and 8 are rejected under 35 U.S.C. 103(a) as being unpatentable over Otsubo et al. (Japanese Patent Publication 11-260596) in view of Sato et al. (U.S. 5,907,221).

Referring to Drawing 1 and 16, and paragraphs [0113]-[0130], Otsubo et al. discloses a plasma processing apparatus comprising a plasma processing gas supply means, an exhaust air means [0114], plasma generating means and a first capacitively coupled discharge means; and a second electromagnetic wave radiation plasma generation means; wherein the first capacitively

coupled discharge means includes an opposed electrode consisting of a plurality of mutually isolated conductors (counterelectrodes 71a 71b 71c) [0115] oppositely disposed with respect to a stage electrode 52 and a means to supply high-frequency power 81 and 82 to the opposed electrode, the first capacitively coupled discharge means being arranged so that a capacitively coupled plasma discharge is generated between the opposed electrode and the stage electrode [0129]; wherein electromagnetic wave radiating means comprises insulators 80a 80b 80c disposed between at least a portion a plasma chamber and the plurality of isolated conductors 71a 71b 71c, respectively, the second electromagnetic wave radiation plasma generating means being arranged so that an electromagnetic wave is radiated from at least a position between the plurality of isolated conductors which are connected to a supply of current through a capacitor 83 and the plasma process chamber forming a resonance circuit including a capacitor 83 so as to generate plasma discharge in the plasma process chamber, a resonance of the resonance circuit including a capacitor being controlled; and wherein the first capacitively coupled discharge means and the second electromagnetic wave radiation plasma generation means combine to provide plasma discharge in the plasma process chamber with enhanced plasma distribution controllability ([0130]-[0131])

Additionally, a high-frequency voltage 81 and 82, whose phase can be shifted by a capacitor 83, is supplied to the isolated conductors 71, thereby generating electromagnetic waves. The power of electromagnetic waves radiates through the insulators and isolated conductors. A resonant circuit is formed via the insulators 80 and the capacitor 83. The signal generator 97 controls the phase of the high-frequency signal [0130]. Alternately, the electromagnetic waves can be generated by antenna 11 [0041].

Specifically, the distribution of the plasma density can be controlled by controlling the radiated electromagnetic waves based on the adjustment of the phase of the high-frequency voltage supplied to the isolated conductors 71. Moreover, the distribution of the plasma density due to capacitive coupled plasma can be controlled by controlling the outputs of the high frequency power supplies 81 and 82 [0131].

Regarding claim 2, Otsubo et al. discloses a magnetic field formed by a coil 58 ([0121] and [0131])

Regarding claims 7 and 8, a means to supply RF current (bias power supply 56) to a substrate 55 [0122].

Regarding claim 8, multiple RF current conducting means (counterelectrodes 71a 71b 71c) are installed at a position opposite to a position where the substrate 55 to be processed is mounted. The multiple RF current conducting means are provided with a means (filters) to control a ratio of RF current flowing from the substrate to be processed to each of the RF current conducting means. Moreover, each isolated conductor 71a 71b 71c is grounded through low pass filters (not shown), and a high-frequency current from a bias power supply 56 is allowed to flow through each of the isolated conductors 71a 71b 71c [0116]. Thus, the filter controls the ratio of RF current flowing from the substrate to each of the isolated conductors 71a 71b 71c.

Otsubo et al. fails to teach supplying a high-frequency power to the electrode through a matching box.

Referring to Figures 6 and 7 and column 4, lines 5-37, Sato et al. teaches a plasma processing apparatus wherein high-frequency power 170 is supplied to the electrode 150'a

through a matching box 165a. It is well known in the art to use a matching box between the electrode and the power supply in order to provide efficient power transfer between the power supply and the electrode. Thus, it would have been obvious to one of ordinary skill in the art at the time of the invention to provide the a matching box between the electrode and high-frequency power supply means of Otsubo et al. as taught by Sato et al. since this would yield efficient power transfer between the power supply and the electrode.

5. Claim 3 is rejected under 35 U.S.C. 103(a) as being unpatentable over Otsubo et al. (Japanese Patent Publication 11-260596) in view of Sato et al. (U.S. 5,907,221) as applied to claims 1, 2, 7, and 8 above, and further in view of Tobe et al. (U.S. 5,891,349).

The teachings of Otsubo et al. in view of Sato et al. have been discussed above.

Otsubo et al. in view of Sato et al. fails to teach a means to store and a distribution controller to control plasma distribution.

Referring to Figures 1 and 8, column 10, lines 6-57, and column 14, lines 17-30, Tobe et al. discloses a plasma processing apparatus having a distribution controller 105 (variable capacitor controller) which includes a CPU. The distribution controller 105 (variable capacitor controller) controls the radiated electromagnetic wave power through the variable capacitor 81a. Variable capacitors are used to control the electrode's potential. The controller is used to more precisely control the inputs/outputs of the variable capacitors. Furthermore, the CPU is capable of storing a processing procedure to control distribution during plasma processing, and thus control plasma distribution according to the processing procedure stored. Therefore, it would have been obvious to one of ordinary skill in the art to provide the apparatus of Otsubo et al. in

view of Sato et al. with the means to store and a distribution controller to control plasma distribution as taught by Tobe et al. since this would precisely control the potential of the electromagnetic wave radiating means, and thus control the plasma distribution.

### ***Response to Arguments***

6. Applicant's arguments with respect to claims 1-3, 7, and 8 have been considered but are moot in view of the new ground(s) of rejection.

### ***Conclusion***

7. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Michelle Crowell whose telephone number is (571) 272-1432. The examiner can normally be reached on M-F (9:00 - 5:30).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Gregory Mills can be reached on (571) 272-1439. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

AMC *AME*  
November 18, 2004

*Gregory Mills*  
GREGORY MILLS  
SUPERVISORY PATENT EXAMINER  
TECHNOLOGY CENTER 1700